

TeMA

Journal of
Land Use, Mobility and Environment

The climatic, social, economic and health phenomena that have increasingly affected our cities in recent years require the identification and implementation of adaptation actions to improve the resilience of urban systems. The three issues of the 15th volume will collect articles concerning the challenges that the complexity of the phenomena in progress imposes on cities through the adoption of mitigation measures and the commitment to transforming cities into resilient and competitive urban systems.

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THE CITY CHALLENGES AND EXTERNAL AGENTS.
METHODS, TOOLS AND BEST PRACTICES

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The cover image shows a sea glacier ice that melts away.

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Contents

177 EDITORIAL PREFACE
Rocco Papa

FOCUS

179 **Prioritizing active transport network investment using locational accessibility**
Bahman Lahoorpoor, Hao Wu, Hema Rayaprolu, David M. Levinson

193 **Residential development simulation based on learning by agent-based model**
Hamid Mirzahosseini, Vahid Noferești, Xia Jin

LUME (Land Use, Mobility and Environment)

209 **The Structural Plan's sustainability in coastal areas. A case study in the Tyrrhenian coast of Calabria**
Lucia Chieffallo, Annunziata Palermo, Maria Francesca Viapiana

227 **Combining resources and conversion factors**
Mohammad Azmoodeh, Farshidreza Haghghi, Hamid Motieyan

249 **Youth urban mobility behaviours in Tunisian Sahel**
Aymen Ghédira, Mehdi El Kébir

263 **Renaturalising lands as an adaptation strategy. Towards an integrated water-based design approach**
Ilaria De Noia, Sara Favargiotti, Alessandra Marzadri

287 NextGenerationEU in major Italian cities

Carmela Gargiulo, Nicola Guida, Sabrina Sgambati

EVERGREEN

307 Trigger urban and regional planning to cope with seismic risks: management, evaluation and mitigation

Paolo La Greca

REVIEW NOTES

317 Climate adaptation in the Mediterranean: heat waves

Carmen Guida

325 Accelerate urban sustainability through European action, optimization models and decision support tools for energy planning

Federica Gaglione, David Ania Ayiine-Etigo

335 Planning for sustainable urban mobility in Southern Europe: insights from Rome and Madrid

Gennaro Angiello

341 Sustainable cities and communities: the road towards SDG 11

Stefano Franco

345 The interventions of the Italian Recovery and Resilience Plan: Energy efficiency in urban areas

Sabrina Sgambati

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REVIEW NOTES – NextGenerationEU and urban development

The interventions of the Italian Recovery and Resilience Plan: Energy efficiency in urban areas

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Abstract

Starting from the relationship between urban planning and mobility management, TeMA has gradually expanded the view of the covered topics, always following a rigorous scientific in-depth analysis. This section of the Journal, Review Notes, is the expression of a continuous updating of emerging topics concerning relationships among urban planning, mobility and environment, through a collection of short scientific papers. The Review Notes are made of five parts. Each section examines a specific aspect of the broader information storage within the main interests of TeMA Journal.

This section of the Review Notes explores a specific topic, related to cities, within the framework of the European program NextGenerationEU.

This contribution deepens the topic of energy efficiency in urban areas, providing an overview of the proposed interventions to improve energy management and save natural resources in the Italian Recovery and Resilience Plan (NRRP). The aim is deepening how these measures are intended to make Italian cities more sustainable, livable and environmental-friendly. Furthermore, it highlights the main strategies, reforms, and interventions which have been activated in Italian cities, thanks to the NRRP investments.

Keywords

Italian recovery and resilience plan; Energy efficiency; Sustainability; Cities.

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1. Energy in cities

Cities are at the core of the challenges of decarbonization and climate change mitigation and adaptation. Cities are, indeed, the main energy consumers, given that they are responsible for about 75% of the world's energy consumption and over 70% of global greenhouse gas emissions (UN, 2021). In addition, urban sprawl and the increasing demand for transport to reach different destinations have exacerbated the overall reliance on private motorized transport, further contributing to higher energy and resources consumption.

On the other hand, cities have the physical, technological, and environmental resources necessary to handle these future challenges. The possibility to reduce the carbon footprint of cities is connected both with smart grids and energy-efficient/green buildings. In order to reach the goals of low carbon energy generation and distribution, energy efficiency improvements in different sectors and, above all, at the urban scale are urgently needed. With a view to minimizing the ecological footprint of cities, energy systems need to be changed, becoming more environmental-friendly, inclusive, and fair to foster sustainable development.

To meet this necessity, numerous scholars have deepened the relationship between cities and energy consumption, by identifying which urban characteristics determine higher levels of consumption and, at the same time, highlighting which ones may be implemented to obtain better energy performance in cities (Gargiulo & Russo, 2017).

The urban features that influence energy consumption and GHG emissions can be classified into physical, functional, geographical, and socio-economic features. Physical features include the urban shape, fragmentation, and polycentricity, as well as the presence and distribution of green urban areas (Banister, 1997; Chen et al., 2011; Gargiulo et al., 2016). Functional features relate to the distribution and the type of activities and services settled in a territory (e.g. production activities, commercial, retail activities, etc.) (Gargiulo & Russo, 2017). The geographical features comprise the geomorphological, environmental and climate, settlement, and network characteristics of a territory, able to influence, for instance, the demand for energy for heating and cooling, but also the demand for transport (Liu et al., 2012; Creutzig et al., 2015). The socio-economic features concern the behavior of citizens in relation to energy management and also affordability issues (McLoughlin et al., 2012; Paco & Lavrador, 2017). Once these features have been identified, it is possible to develop models to simulate the energy consumption distribution or study the energy efficiency performance of a city in order to support decision-makers in either taking action on the most critical zones or improving the high-consumption or low-efficiency sectors. Energy consumption must be reduced by changing consumption patterns of cities and adopting energy-saving techniques that counts also on technological instruments and smart solutions. This type of action might also improve the economic performance of cities, thanks to the attraction of new companies and resources (Mazzeo, 2013)

Italy has activated numerous measures that have stimulated important investments in the energy field. Energy and sustainability policies, such as the Integrated National Energy and Climate Plan and the Long-Term Strategy for the Reduction of Greenhouse Gas Emissions, have determined the penetration of renewable energy, but there is still a lot of room for improvement. The objective for the future is the progressive decarbonization of all the sectors, from mobility to the productive system.

2. Energy efficiency in the Italian NRRP

Energy is one of the emerging fields of investment in the Italian NRRP. As part of the European program NextGenerationEU, Member States should explain how their Plans contribute to achieving the climate, environmental, and energy objectives adopted by the European Union. The goals of the plans concern the reduction of GHG emissions, the use of renewable sources to produce energy, energy efficiency, the integration of the energy system, new clean energy technologies, and smart grids.

This topic is attracting increasing attention, especially after the Ukrainian crisis which has determined scarcity or lack of natural resources and the consequent increasing costs for energy, fuel, gas, and so on. For this

reason, the European Union is working on a new program, on the model of the NestGenerationEU, which is called REPowerEU. This program aims at providing the necessary resources to become Europe independent from other countries, for what concerns energy sources. The measures in the REPowerEU Plan promote energy savings, diversification of energy supplies, and accelerated roll-out of renewable energy to replace fossil fuels in homes, industry, and other activities.

However, NextGenerationEU has already taken action in this direction, allocating resources to encourage the ecological transition of the Member countries. The mission of the Italian NRRP in which we can find a correspondence with the topic of energy efficiency in cities is M2 "Ecological Transition and Green Revolution". This mission includes investments and research programs for renewable energy, the development of the hydrogen supply chain, and sustainable mobility in urban areas. In addition, it provides actions aimed at saving energy consumption through the efficiency of public and private real estate. The mission relies on €59.33 billion with €19.69 billion for cities and €1.21 billion for the improvement of buildings' energy efficiency. In 2022, it is expected a target of about €1.56 billion for the component C2 Renewable energy, hydrogen, network, and sustainable mobility and about €1.73 billion for the component C3 Energy efficiency and redevelopment of buildings. For what concerns the C2 component, most of the projects are related to Sustainable Mobility and the strengthening of smart grids, while the C3 component foresees projects already started in the year 2021, namely "Ecobonus and Sismabonus" reforms, which include facilitations for the adaptation of the building stock in the seismic and energy systems. Component C4 is related to general topics such as sustainability and resilience of the territories. It considers energy efficiency as a priority objective to enhance the climate resilience of buildings and territories and to reach sustainable development targets.

ID of the investment	Investment	Implementing bodies	Resources (€ billion)
M2C2.1.2	Promotion of renewable resources in small communities	Municipalities with less than 5k inhabitants	2.2
M2C2.1.4	Reinforcement of smart grids	Territories	3.61
M2C2.4.1	Reinforcement of cycling mobility	Municipalities and Metropolitan Cities	0.2
M2C2.4.2	Rapid transportation	Municipalities and Metropolitan Cities	4.8
M2C2.4.4	Renovation of bus fleets and National Strategic Plan	Municipalities (specifically with higher levels of pollution)	2.415
M2C3.1.1	Plan for the substitution and energy redevelopment of the school buildings	Local actors	0.8
M2C3.2.1	Ecobonus and Sismabonus for the buildings' efficiency and safety	Private actors	10.26
M2C4.2.2	Interventions for the energy efficiency of the territories	Municipalities	6.6
M2C4.3.1	Urban reforestation	Metropolitan Cities	0.330

Tab.1 the investments for urban regeneration in the Italian Plan for Recovery and Resilience (Source: Openpolis <https://www.openpolis.it/i-nostri-open-data-per-il-monitoraggio-del-pnrr/>)

The first investment in Tab.1 includes the realization of 200 km of urban and metropolitan cycle paths by 2023 and 365 km by 2026. The second investment aims at realizing 240 km of new infrastructures and networks for more rapid connections among municipalities and metropolitan areas. Specifically, the metropolitan cities involved are Catania and Napoli.

The investment M2C2.4.4 is intended at buying zero-emissions buses, with one-third of the resources destined for major Italian cities. The investment M2C4.2.2 finances interventions for the territories' energy efficiency and sustainable development. The investment aims to improve the public lighting system, promote energy savings in public buildings and install new plants to produce energy from renewable resources. In the table below there are reported also interventions connected with the valorization of green spaces and the reforestation of urban areas. This is because the presence of green areas is able to improve urban micro-climate conditions and, thus, reduce the energy consumption necessary to fuel the cooling systems.

To summarize, the topic of energy efficiency in urban areas in the plan includes measures that deal with the strengthening of sustainable mobility, the energy redevelopment of buildings stocks, the valorization of green public spaces, the encouragement of private action to improve the energy performance of buildings and consequently urban areas. Dealing with energy issues is important to tackle the challenges linked to the scarcity of resources and the unavoidable consequences of climate change that threaten the future of urban systems.

At the same time, the improvement of energy efficiency in urban areas aims at increasing sustainability and enhancing livability in urban areas. Measures at the building level must be accompanied, according to the NRRP, by integrated actions at the urban and metropolitan levels in order to obtain more efficient and successful results. That is why the plan integrates the action of municipalities and metropolitan areas with the actions of private and local actors.

Once completed, the interventions will provide substantial benefits in terms of energy performance and environmental sustainability, but also in terms of urban attractiveness and competitiveness for companies and firms specializing in the field of energy management or production.

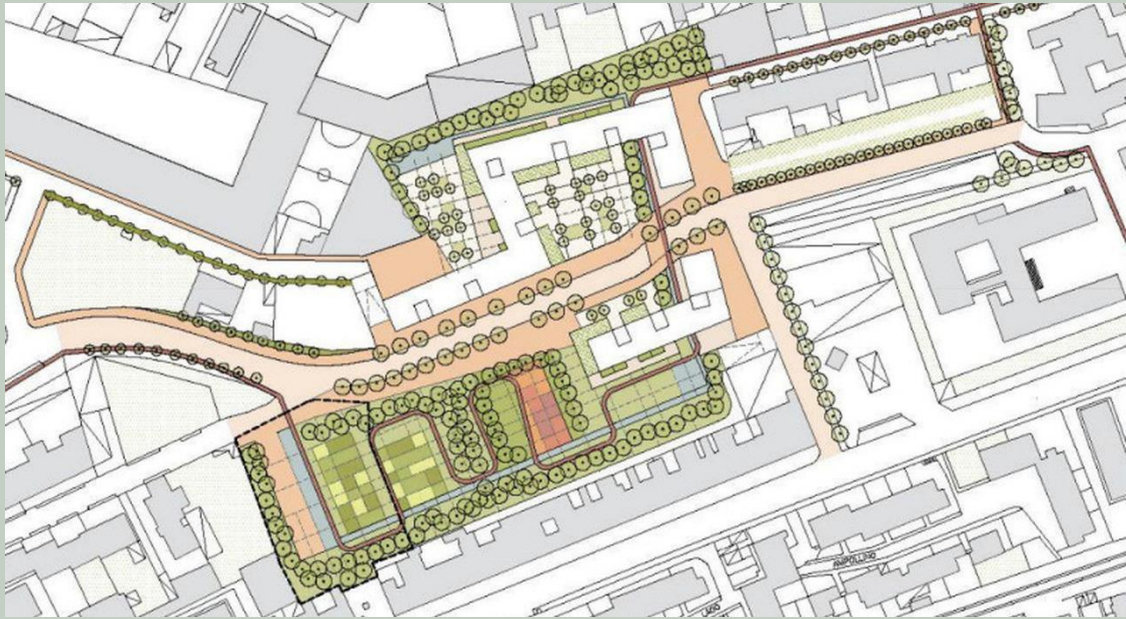
Subsequently, there is review of the main results achieved through the implementation of the NRRP in the Italian territories, in the field of energy efficiency.

National portal on the energy performance of buildings

The National Portal on the Energy Performance of Buildings (PNPE2) is one of the results of the collaboration between the Ministry of ecological transition and the organization ENEA. The portal aims at providing information and assistance for citizens, enterprises, and public administration in the field of energy consumption monitoring and management. The final goal is to reach higher levels of efficiency for the whole country, starting with the action on single buildings. One of the potentialities of the tool is to raise awareness of the population about energy consumption in their properties, so that they may become the main actors of the transition. Citizens can find personalized data to orient themselves on investment opportunities for their property. Thanks to the communication with regional platforms the same data system is available to support statistical and research purposes. In detail, the portal provides information and technical support for the monitoring of national energy efficiency targets, the integration of renewable energy in buildings, and the state of advancement of strategies, programs, and projects related to the energy redevelopment of real estate. The portal has been included among the "enabling reforms" indicated in the PNRR for the measure M2C3 (energy efficiency and redevelopment of buildings). PNPE2 integrates the data present respectively in (i) the regional platforms of energy performance certificates (APE-R); (ii) the regional sites of thermal installations cadastre (CIT-R); (iii) the portals for territorial development policies (ESPA-PAES); (iv) and those for energy audits of companies (AUDIT 102). In compliance with the regulations, the additional databases related to the management of other administrations will also be integrated in the future.

These aspects make PNPE2 very powerful for urban planning research since it might allow the development of supportive tools aimed at identifying the most critical areas in terms of energy consumption and selecting the best solutions to improve their performance. The portal meets the NextGenerationEU objectives both in terms of ecological transition and the digital revolution. As a matter of fact, it contributes to the monitoring of energy consumption in cities through a bottom-up approach, enabling decision-makers to intervene in the most degraded areas in terms of energy performance. On the other hand, it contributes to the digitalization of the energy sector at the local and national level.

Eco-neighborhoods in the City of Naples



As part of energy efficiency measures for public housing, the City of Naples has proposed a project for the construction of an eco-neighborhood in the district of Ponticelli through the demolition of existing informal housing. The target of energy efficiency improvement is embedded within a project of redevelopment and regeneration of the district, for which the ecological transition represents a fundamental step. Urban regeneration, indeed, plays a key role in energy improvement and the reduction of emissions, and it should aim to intervene in the existing building stock, rather than create new ones to reduce consumption.

The project comprises the construction of 104 housing facilities for the inhabitants of the buildings to be demolished, for a total cost of €25.7 million, 23.760 million deriving from the complementary fund of the PNRR, and € 1.978 million from the Strategic Plan of the Metropolitan City. A second project regards the interventions in green areas and public spaces, in Via Scarpetta. The interventions proposed involve the construction of parks, urban gardens, and parking areas, for a total cost of €37 million. Another project concerns the 'lotto 10' of Ponticelli, where there is a residential building complex, built with the L. 18 April 1962, nr. 167, which needs requalification. This project is included in the greatest plan PUA of Ponticelli on which the municipal administration is working, thanks to the resources of various entities of the 2020 program agreement.

Many abandoned spaces, such as Via Coppi, Via Napolitano, Via Malibrán, Via Califano, Via Malaparte, Via Pomilio, Via Miranda, Viale Merola, will be redeveloped with a view to improving not only the livability of the district but also the energy performance of the building stock and urban public spaces.

The district will be redeveloped through trees, green areas, playgrounds, urban gardens, and a system for the collection and recycling of water, all aspects that have a great positive impact on the energy efficiency of urban areas. Additionally, a road park will be built with the regeneration of Via Isidoro Fuortes in order to reach also sustainable mobility goals. The construction of new accommodation will be made in accordance with the anti-seismic regulations and the principles of energy efficiency. Another fundamental piece of the project regards the areas wedged between Via Fausto Coppi and Via Napolitano and those along Via Malibrán and Via Martiri della Libertà.

The PUA proposes the realization of a line consisting of parking areas, urban forests, vegetable gardens, ornamental green areas, and linear parks to encourage soft mobility, favor the requalification and permeabilization of soils, and promoting high-quality open spaces, with benefits for the overall energy patterns of the district. The ideas were presented by the Councillor for Urban Planning to the Council of the Municipality of East Naples which established a special commission to follow the projects.

(Image Source Il Mattino, 2022. Retrieved from: https://www.ilmattino.it/napoli/citta/napoli_progetti_recupero_ponticelli-6607297.html)

Green Communities

The call for proposals to create 30 Green Communities in Italy counts on €129 thousand, allocated, specifically, by Mission 2, dedicated to the green revolution and ecological transition. By promoting the development of local communities that wish to use their resources including water, forests, and the landscape in a balanced way, the call for proposals finances at least 30 projects on the basis of energy-sustainable development plans, and environmental, economic, and social growth. Project proposals should be submitted by neighboring municipalities of the same Region or Autonomous Province

and only in aggregate form (unions of municipalities, mountain communities, etc.). Among the fields of investments, there is also the production of energy from local renewable sources, such as micro-hydroelectric plants, wind, cogeneration, and biomethane. The project aims to promote the sustainable and resilient development of rural and mountain areas, exploiting their vocations and opportunities: it will encourage the birth and growth of local communities, also coordinated and/or associated, giving them support for the development, financing, and implementation of sustainable development plans from an energy, environmental, economic and social point of view.

The plans will include, for the 30 pilot Green Communities, the integrated and certified management of the agro-forest heritage and water resources; the production of energy from local renewable sources; the development of sustainable tourism; the construction and sustainable management of the building stock and infrastructure of a modern mountain; energy efficiency and the intelligent integration of plants and networks; the development of zero waste production activities; the integration of mobility services; the development of a sustainable model for farms.

Rome, Florence, Bologna and Milan for a sustainable mobility

The ecological transition of the mobility sector represents another important milestone in the process of energy transformation in our cities. As a matter of fact, the mobility sector is one of the most responsible for traditional energy resource consumption and pollutant emissions. Therefore, the transformation of the mobility sector is one of the fundamental targets of the Italian PNRR, also to ensure our territory's energetic self-sufficiency in the future.

In this context, many Italian cities are activating processes of renovation of the public transport system, exploiting the availability of European resources. The city of Milan, for instance, has authorized the request to assign the NRRP resources to ATM for the program of renewal of the fleet and the relative infrastructures of recharge. These funds will allow ATM to continue the plan on electric mobility that provides the complete renewal of the public transport, rendering it completely to impact zero by 2030. The City of Rome has invested in rail and high-speed sectors, mass rapid transport, and the renewal of the circulating bus fleet. The most important work will then be the C line of the subway, along with the extension of lines A and B and the tramway Termini-Vaticano-Aurelio. €36 million are destined for the improvement of cycling mobility. The City of Florence will utilize the funding for the renewal of the bus fleet as well, but a consistent amount of funding is destined for the construction of support infrastructure for the electric supply of vehicles. The city of Bologna also accelerates the transition to electric and hydrogen public transport, which is used also to improve the connectivity between suburban areas and the city center. The Municipality of Bologna has also submitted a request for an additional € 91.3 million for the supply of hydrogen and electricity and related infrastructure. This objective will be pursued thanks to the strengthening of the Metropolitan Railway Service and the construction of the tram line that will replace some existing bus lines.

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